CLAIMS

What is claimed is:

1. A method comprising:

receiving relative placement constraint information, the relative placement constraint information indicating a relative placement of a plurality of layout objects with respect to each other, wherein at least a first one of the plurality of layout objects is at a different level of hierarchy in the layout than at least a second one of the plurality of layout objects; and

automatically placing the plurality of layout objects according to the relative placement constraint information.

2. The method of claim 1 further comprising

automatically placing any remaining layout objects for an integrated circuit layout using a conventional placement engine.

3. The method of claim 1 wherein receiving relative placement constraint information includes

receiving information indicating a relative placement of a first layout object with respect to a second layout object wherein each of the first and second layout objects is one of an instance, group or vector.

4. The method of claim 3 wherein receiving information indicating a relative placement includes

receiving information indicating that the first layout object is to be placed relative to the second layout object according to one of a set of relative placement operations including horizontal step, vertical step, horizontal abut, vertical abut, interleave and merge.

5. The method of claim 4, wherein automatically placing includes determining an order for placing layout objects if no order is specified in the relative placement constraint information.

6. The method of claim 4 further comprising creating a new group as a result of each of the set of relative placement operations.

7. The method of claim 6 wherein creating a new group comprises one of

creating a hard group in which relative placement constraints are specified for each layout object in the hard group, and

creating a soft group in which relative placement constraints are not specified for each layout object in the soft group.

8. The method of claim 3, wherein receiving relative placement user constraint information includes

receiving absolute constraint information, the absolute constraint information including one of a space specification, a keep-out region specification and an open bit specification.

9. The method of claim 1 wherein receiving relative placement constraint information includes

receiving information specifying global options, the global options including one or more of a boundary, a number of bits in a datapath, an orientation of a unit, a well-alignment direction, a rowsite height and a bit structure.

10. The method of claim 9 wherein automatically placing the plurality of objects includes

applying the specified global options to each of the plurality of layout objects unless a conflicting object-specific constraint is received.

11. The method of claim 1 wherein receiving relative placement information includes

receiving object-specific constraints, the object-specific constraints including one or more of a span, a bit structure, a well-alignment style, a rowsite height, a stride, a height and width and a rigidness indicator.

12. The method of claim 11 wherein automatically placing includes

applying the object-specific constraints to associated layout objects where a conflicting global option is also specified.

13. An apparatus comprising:

a relative placement engine to produce a detailed placement in response to receiving a schematic specifying a plurality of layout objects and a set of user constraints, the user constraints specifying a placement of at least some of the layout objects relative to each other, at least one of the specified objects being at a different level of layout hierarchy than another one of the specified objects.

14. The apparatus of claim 13 further comprising:

a conventional placement engine coupled to the relative placement engine, the conventional placement engine to work with the relative placement engine to produce the detailed placement, the conventional placement engine to place any layout objects not specified in the user constraints.

15. The apparatus of claim 13 further comprising:

a constraint extraction engine to receive a first detailed placement and to extract user constraint information from the first detailed placement to be provided to the relative placement engine to produce a revised detailed placement.

16. The apparatus of claim 13 wherein the user constraint information received by the relative placement engine includes

relative placement information indicating a relative placement of at least a first layout object with respect to at least a second layout object.

17. The apparatus of claim 16 wherein the first and second layout objects are each one of an instance, group and vector.

18. The apparatus of claim 17 wherein the relative placement information includes

at least one relative placement operator from a set including a horizontal step operator, a vertical step operator, a horizontal abut operator, a vertical abut operator, an interleave operator and a merge operator.

19. The apparatus of claim 13 wherein the user constraint information includes

an object-specific constraint from a set of object-specific constraints including span, bit structure, well-alignment style, rowsite height, stride, alignment guidelines, height, width, and rigidness.

20. The apparatus of claim 19 wherein the user constraint information includes

a global constraint from a set of global constraints including a boundary, an origin, a number of bits in a datapath, an orientation of a unit, a well-alignment direction, and a rowsite height.

21. The apparatus of claim 20 wherein, if an object-specific constraint conflicts with a global constraint, the object-specific constraint takes precedence.

22. The apparatus of claim 13 wherein the user constraint information includes

an absolute constraint from a set of absolute constraints including a space constraint, an obstacle constraint, an open bit constraint, a net length constraint, an absolute offset constraint, and a net width constraint.

23. A method comprising:

receiving an integrated circuit schematic that specifies a plurality of objects to be placed;

receiving a user constraint specification, the user constraint specification specifying a relative placement for a first set of the plurality of objects, at least one of the objects in the first set being at a different level of layout hierarchy than at least one other object in the first set;

automatically placing the objects in the first set according to the relative placement indicated in the user constraint specification; and

automatically placing any remaining objects specified by the schematic using a conventional placement approach.

24. The method of claim 23 wherein receiving a user constraint specification includes

receiving relative placement information indicating a relative placement operation to be performed on a first layout object in the first set with respect to a second layout object in the first set, the relative placement operation being one of a set including a horizontal step operation, a vertical step operation, a horizontal abut operation, a vertical abut operation, an interleave operation and a merge operation.

25. The method of claim 23 wherein receiving a user constraint specification includes

receiving absolute placement information including an absolute placement operation from a set including an open space operation, an obstacle operation, an open bit operation and a net length or weight operation.

26. The method of claim 26 further comprising

processing the absolute placement information after automatically placing the objects, and

adjusting the automatic placement of the objects after processing the absolute placement information.

27. The method of claim 23 wherein receiving user constraint information includes

receiving global options, the global options being from a set including a boundary, an origin, a number of bits in a datapath, an orientation of a unit, a well-alignment direction, a rowsite height and a bit structure,

receiving object-specific constraints, the object-specific constraints being from a set including a bit span, a bit structure, a well-alignment style, a rowsite height, a stride, a height, a width and a rigidness, and

prioritizing an object-specific constraint over a conflicting global option.

28. A method comprising:

receiving relative placement constraint information for a first design;

receiving process and other constraints related to a second design; and

receiving a schematic specifying objects to be placed for the second design; and

providing a detailed placement for the second design using the relative placement constraint information for the first design.

29. The method of claim 28 further comprising:

extracting the relative placement constraint information for the first design from a detailed placement for the first design.

30. An article of manufacture comprising a machine-accessible medium including data that, when accessed by a machine, cause the machine to:

produce a detailed placement in response to receiving a schematic specifying a plurality of layout objects and a set of user constraints, the user constraints specifying a placement of at least some of the layout objects relative to each other, at least one of the specified objects being at a different level of layout hierarchy than another one of the specified objects.

31. The article of manufacture according to claim 30 wherein the machine-accessible medium further includes data that, when accessed by a machine causes the machine to:

place a first set of the plurality of layout objects according to relative placement constraints specified in the user constraints, and

place the remainder of the plurality of layout objects according to conventional placement techniques.

32. The article of manufacture of claim 31 wherein the relative placement constraints include one of the relative placement constraints of a set including a horizontal step constraint, a vertical step constraint, a horizontal abut constraint, a vertical abut constraint, an interleave constraint and a merge constraint.

33. The article of manufacture of claim 31 wherein the user constraint information includes an absolute constraint from a set including an open space constraint, an obstacle constraint, an open bit constraint, a net length constraint, and a net weight constraint.

34. The article of manufacture of claim 31 wherein the user constraint information specifies a global option from a set of global options including a boundary, an origin, a number of bits in a datapath, an orientation of a unit, a well-alignment style, a rowsite height and a bit structure.

35. The article of manufacture of claim 34 wherein the user constraint information specifies an object-specific constraint from set of object-specific constraints including a span, a bit structure, a well-alignment style, a rowsite height, a stride, a height, a width and a rigidness.

36. The article of manufacture of claim 35 wherein, if the user constraint information specifies an object-specific constraint that conflicts with a global option, the object-specific constraint is applied.